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EXAMINER	
LEGASSE JR, FRANCIS M	

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2878	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/804,203	KNAPP, RONALD H.	
	Examiner	Art Unit	
	FRANCIS M. LEGASSE JR	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 April 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *5-18 and 21-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *5-18 and 21-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 March 2009* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Status of Claims

Claims 5-18 and 21-23 are pending.

Claim Objections

Applicant is requested to review all claims for grammatical errors. There are many grammatical errors present in the amended claims.

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the “covering comprises a strengthening wrap would over the composite gas storage tank, wherein the fiber is squeezed between the tank liner and the strengthening wrap as the tank liner is pressurized deforming pinch points" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an

application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 22 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 22, Applicant recites, "The apparatus of claim 1", on line 1. Applicant has cancelled claim 1. Therefore, for examination purposes the examiner will treat claim 22 as dependent on claim 21.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 8-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuichi et al. (US Patent No. 5,531,290, "Furuichi", hereinafter) in view of Tamura et al. (US Patent No. 5,829,418, "Tamura", hereinafter).

Regarding claim 8, Furuichi *(figure 2)* discloses a method of providing sensors for tank volume change comprising:

- Providing a tank (1);
- Providing an optical fiber (55) on the tank liner (1);
- Providing pinch points in the optical fiber (55) by crossing the optical fiber (55) over the obstructions;
- Securing the entire optical fiber (55) or at least the pinch points to the tank (1) (col. 21, line 40-41);
- Providing (56) and exposing ends (57) on the optical fiber (55) for receiving light and outputting light.

Furuichi fails to teach covering the optical fibers and the tank.

Tamura *(figure 2)* discloses a gas tank comprising a covering (23, 24).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the covering of Tamura in combination with the tank of Furuichi because it will provide increased protection of the tank, thus further preventing the possibility of leaks.

Regarding claim 9, Furuichi as modified by Tamura *(Furuichi figure 2)* discloses a method of providing sensors for tank volume change wherein providing the tank (1) comprises providing a cylindrical tank liner, wherein the providing an optical fiber (55) and obstructions on the tank comprises winding the optical fiber in first spaced helical convolutions in a first direction along the cylindrical tank liner (1) and winding the optical fiber (55) in second spaced helical convolutions in a second direction along the

cylindrical tank liner and forming the pinch points in the second spaced helical convolutions where they cross over the first helical convolutions of the optical fiber (55).

Regarding claim 10, Furuichi as modified by Tamura *(Tamura: figure 2)* discloses a method of providing sensors for tank volume change wherein the covering (23, 24) comprises covering the optical fibers with an isolator layer (24).

Regarding claim 11, Furuichi as modified by Tamura *(Tamura: figure 2)* discloses a method of providing sensors for tank volume change wherein the covering (24, 25) further comprises providing filament windings (carbon fibers) over the isolator layer (24) of the optical fiber and over the tank liner (25) for supporting internal pressures within the tank liner (25) (col. 5, lines 35-40).

Regarding claim 12, Furuichi as modified by Tamura *(Furuichi figure 2)* discloses a method of providing sensors for tank volume change wherein the securing comprises coating the optical fiber (55) with a settable adhesive as the optical fiber is wound on the tank (1) (col. 21, line 40-41).

Regarding claim 13, Furuichi as modified by Tamura *(Furuichi figure 2)* discloses a method of providing sensors for tank volume change wherein the securing comprises coating crossover pinch points with a flexible settable adhesive (col. 21, line 40-41).

Regarding claim 14, Furuichi as modified by Tamura *(Furuichi figure 2)* discloses a method of providing sensors for tank volume change further comprising connecting a light source (62) to one end of the optical fiber (55) and connecting a fight sensor (81) to the other end of the optical fiber, increasing pressure within the tank liner

(1), increasing bending in the pinch points by resisting the increasing pressure with the filament windings, and observing transmitted light attenuation in the light sensor (81) related to expansion of the tank liner and increasing bending of the pinch points (col. 10, lines 45-54).

Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuichi et al. (US Patent No. 5,531,290, "Furuichi", hereinafter) in view of Watanabe et al. (US Patent No. 6,042,071, "Watanabe", hereinafter) and Tamura.

Regarding claim 5, Furuichi *(figure 2)* discloses a sensor apparatus for tank volume change comprising:

- A tank (1),
- A telephone grade optical fiber (55) coated with adhesive would on the tank (1) and having the adhesive cure on the tank, adhering the fiber on the tank and ruggedizing the fiber (55) on the tank (1) (col. 21, line 40-41),
- The optical fiber (55) having opposite ends exposed for receiving (56) and outputting light energy,
- Wherein the optical fiber (55) is wound helically in first spaced coils over the tank (1) in a first direction and is wound helically in second spaced coils over the tank (1) and over the first spaced coils in a second direction, and wherein the first spaced coils form the obstructions and the second spaced coils form the bends where the second spaced coils cross over the first spaced coils as pinch points.

Furuichi fails to teach that the tank comprises an aluminum liner and a covering

comprising a strengthening wrap would over the composite gas storage tank, wherein the fiber is squeezed between the tank line and the strengthening wrap as the tank liner is pressured deforming the pinch points.

Watanabe *(figure 4)* teaches a gas tank (1) comprising an aluminum liner (col. 1, lines 9-12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use an aluminum tank liner with the tank of Furuichi because it is a lightweight material yet is strong and durable and will provide an effective means to hold and contain the gas safely.

Furuichi as modified by Watanabe fails to teach a covering comprising a strengthening wrap would over the composite gas storage tank, wherein the fiber is squeezed between the tank line and the strengthening wrap as the tank liner is pressured deforming the pinch points.

Tamura *(figure 2)* discloses a gas tank comprising a strengthening wrap (23, 24) would over the composite gas storage tank (25) , wherein the fiber is squeezed between the tank line and the strengthening wrap as the tank liner is pressured deforming the pinch points.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the strengthening wrap of Tamura in combination with the tank of Furuichi as modified by Watanabe because it will provide increased protection of the tank, thus further preventing the possibility of leaks.

Regarding claim 6, Furuichi as modified by Watanabe and Tamura *(Furuichi:*

figure 2) discloses a sensor apparatus for tank volume change wherein the first and second spaced coils are secured to the tank (1) (col. 21, line 40-41).

Regarding claim 7, Furuichi as modified by Watanabe and Tamura *(Furuichi: figure 2)* discloses a sensor apparatus for tank volume change wherein the bends and pinch points are secured to the tank (1) with a flexible adhesive (col. 21, line 40-41).

Claims 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuichi in view of Tamura and Innocenti et al. (EP 0892 244 A2, "Innocenti", hereinafter).

Regarding claim 15, Furuichi *(figure 2)* discloses a sensor apparatus for tank volume change comprising:

- an optical fiber (55) secured to an outer surface of the tank (1) and having opposite ends for receiving (56) and outputting light (57), the opposite ends being are connected to a light source (62) and to a light sensor (81) as the tank is filled with gas under pressure, the optical fiber (55) crossing on the outer surface of the tank and forming bends and pinch points at crossings.

Furuichi fails to teach a tank having an inlet and outlet wherein the opposite ends of the optical fiber are fixed near the inlet and outlet and wherein a composite material over wrap covering the optical fiber and for withstanding internal pressure within the tank and resisting expansion of the tank.

Tamura *(figure 2)* discloses a gas tank comprising an inlet and outlet and composite material wrap (23, 24) would covering the tank (25), and thus the optical fiber, and for withstanding internal pressure with the tank (25) and resisting expansion

of the tank (25).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the inlet and outlet and the composite wrap of Tamura in combination with the device of Furuichi because the inlet and outlet will allow the gas to be accessible and the cover wrap will provide increased protection, thus reducing the possibility of a leak.

Furuichi as modified by Tamura fails to teach that the opposite ends of the optical fibers are fixed near the inlet and outlet of the tank.

Innocenti *(figure 1)* teaches securing the opposite ends (6, 8) of the optical fiber (4) near the inlet and outlet of the tank (2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to secure the opposite ends of the optical fibers as taught by Innocenti in combination with the apparatus of Furuichi as modified by Tamura because it will provide an easy access to the monitoring device, thus enabling an easy verification that the sensor is working properly.

Regarding claim 16, Furuichi as modified by Watanabe and Innocenti *(Furuichi: figure 5)* discloses a sensor apparatus for tank volume change further comprising optical couplings (63) connected to the ends of the optical fibers and secured to the inlet and outlet of the tank (1a)

Regarding claim 17, Furuichi as modified by Watanabe and Innocenti *(Furuichi: figure 2)* discloses a sensor apparatus for tank volume change further comprising thin adhesive connecting the optical fiber (55) to the outer surface of the tank (1) (col. 21,

line 40-41).

Regarding claim 18, Furuichi as modified by Watanabe and Innocenti *(Furuichi: figure 2)* discloses a sensor apparatus for tank volume change further comprising a relatively flexible adhesive at the optical fiber (55) bends (pinch points) (col. 21, line 40-41).

Claim 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuichi in view of Tamura, Watanabe, Innocenti and Hopenfeld (US Patent No. 5,200,615).

Regarding claim 21, Furuichi *(figure 2)* discloses a sensor apparatus for tank volume change comprising:

- a fluid impervious tank liner (10) for containing a fluid under pressure;
- the fluid impervious liner having a cylindrical body with a closed hemispherical end and a neck;
- a tank liner expansion indicating telephone grade optical fiber (55) helically wrapped around and bonded to the tank liner with an adhesive in crossed first and second helixes from the neck to the closed end and back to the neck, the telephone grade optical fiber in the second helix having cross over points, the fiber having first (56) and second (57) ends and first and second optical connectors (63) on the first and second ends of the telephone grade optical fiber (55) for connecting to a light source (62) and a light intensity sensor (81) to the first and second ends respectively,.

Furuichi fails to teach that the liner is aluminum, the tank has a fluid transfer

connection neck, that the optical fibers are bonded with an epoxy or polyurethane bonding agents, that first and second ends of the fiber mounted near the neck, the light source is laser light and an outer composite strength-providing wrapped layer around the cylindrical body and the hemispherical end and around the crossed helixes of the optical fiber for preventing excessive outward expansion and failure of the fluid impervious liner and for squeezing the cross over points of the optical fiber between the fluid impervious tank liner and the outer strength-providing layer.

Watanabe *(figure 4)* teaches a gas tank (1) comprising an aluminum liner (col. 1, lines 9-12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use an aluminum tank liner with the tank of Furuichi because it is a lightweight material yet is strong and durable and will provide an effective means to hold and contain the gas safely.

Furuichi as modified by Watanabe fails to teach that he tank has a fluid transfer connection neck, that the optical fibers are bonded with an epoxy or polyurethane bonding agents, that first and second ends of the fiber mounted near the neck, the light source is laser light and an outer composite strength-providing wrapped layer around the cylindrical body and the hemispherical end and around the crossed helixes of the optical fiber for preventing excessive outward expansion and failure of the fluid impervious liner and for squeezing the cross over points of the optical fiber between the fluid impervious tank liner and the outer strength-providing layer.

Innocenti *(figure 1)* teaches a tank comprising a fluid transfer connection neck

and securing the first and second ends (6, 8) of the optical fiber (4) near the neck of the tank (2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to secure the opposite ends of the optical fibers as taught by Innocenti in combination with the apparatus of Furuichi as modified by Watanabe because it will provide an easy access to the monitoring device, thus enabling an easy verification that the sensor is working properly.

Furuichi as modified by Watanabe and Innocenti fails to teach that the optical fibers are bonded with an epoxy or polyurethane bonding agents the light source is laser light and an outer composite strength-providing wrapped layer around the cylindrical body and the hemispherical end and around the crossed helixes of the optical fiber for preventing excessive outward expansion and failure of the fluid impervious liner and for squeezing the cross over points of the optical fiber between the fluid impervious tank liner and the outer strength-providing layer.

Hopenfeld *(figure 1)* teaches a tank (18) comprising optical fiber (40) wherein the optical fiber (40) is bonded with an epoxy and the light source (42) is a laser (col. 4, lines 27-50).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the bonding agent and light source of Hopenfeld in combination with the apparatus of Furuichi as modified by Watanabe and Innocenti because it would ensure that the optical fiber is securely connected to the tank, thus preventing an error in the measurement.

Furuichi as modified by Watanabe, Innocenti and Hopenfeld fails to teach an outer composite strength-providing wrapped layer around the cylindrical body and the hemispherical end and around the crossed helixes of the optical fiber for preventing excessive outward expansion and failure of the fluid impervious liner and for squeezing the cross over points of the optical fiber between the fluid impervious tank liner and the outer strength-providing layer.

Tamura *(figure 2)* discloses a gas tank comprising an outer composite strength-providing (23, 24) wrapped layer around the cylindrical body (25) and the hemispherical end and around the crossed helixes of the optical fiber for preventing excessive outward expansion and failure of the fluid impervious liner and for squeezing the cross over points of the optical fiber between the fluid impervious tank liner and the outer strength-providing layer.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the strengthening wrap of Tamura in combination with the tank of Furuichi as modified by Watanabe, Innocenti and Hopenfeld because it will provide increased protection of the tank, thus further preventing the possibility of leaks.

Regarding claim 22, Furuichi as modified by Watanabe, Innocenti, Hopenfeld and Tamura *(Furuichi: figure 2)* teaches that squeezing of the crossover points of the fiber optic cable results in a diminution of the high intensity sensed at the sensor (81).

Note: pinching or blocking of the optical fiber will reduce the amount of light reaching the detector.

Regarding claim 23, Furuichi as modified by Watanabe, Innocenti, Hopenfeld

and Tamura *(Furuichi: figure 2)* teaches the light intensity sensed by the sensor (81) has an inverse linear relation to pressure within the tank (1).

Note: as pressure is increased the tank pinches or blocks light from reaching the sensor, thus reducing the intensity of light at the sensor.

Response to Arguments

Applicant's argument, filed 20 April 2009, that Furuichi fails to disclose the term “pinch points” has been fully considered but is not persuasive. Examiner disagrees. Applicant defines a pinch point as the following: second spaced coils cross over the first spaced coils. While Furuichi does not explicitly use the term "pinch point"; the drawings and specification clearly depict a second spaced coil (horizontal direction) crossing over a first spaced coil (vertical direction). It appears that Applicant may be giving more weight to the term “pinch point" than is actually acceptable. The term “pinch point” is nothing more than a label describing the relationship between the first spaced coils and the second spaced coils. Thus, in view of Applicant's provided description, there is nothing that prevents the examiner's current interpretation. Therefore, the rejections, as set forth above are maintained.

Applicant's argument, filed 20 April 2009, that the Tamura reference has nothing to do with present invention and thus no motivation to combine has been fully considered but is not persuasive. Examiner disagrees. It appears that Applicant may have misinterpreted the combination of the Furuichi reference and the Tamura reference. The combination of Furuichi and Tamura is straightforward and a person of ordinary skill in the art would understand the benefit of reducing the potential for leaks

and providing a stronger outer shell. It appears Applicant fails to see the benefit of applying the covering of Tamura with the tank of Furuichi. However, Applicant's excerpt discloses the benefit of including the covering of Tamura (Remarks, pg. 3). Thus, it is unclear to the examiner why Applicant fails to understand the relevance. Therefore, the rejections, as set forth above, are maintained.

Applicant's argument, filed 20 April 2009, that the Watanabe reference has nothing to do with present invention and thus no motivation to combine has been fully considered but is not persuasive. Examiner disagrees. It appears that Applicant may have misinterpreted the inclusion of the Watanabe reference. The Watanabe reference is merely cited to disclose the possibility of different materials to be used as tanks. A person of ordinary skill in the art recognizes that different materials provide different advantages. The substitution of one tank material for a different one is well within the skill of a person in the art. Therefore, the rejections, as set forth above, are maintained.

Applicant's argument, filed 20 April 2009, that the Innocenti reference fails to teach cross-overs and should not be combined has been fully considered but is not persuasive. Examiner disagrees. It appears Applicant failed to recognize the purpose of the inclusion of the Innocenti reference. The Innocenti reference was not incorporated to disclose “cross overs” but rather the location of optical fibers with respect to the tank neck. Thus, Applicant’s arguments are not relevant to the provided combination. Therefore, the rejections, as set forth above, are maintained.

Applicant's argument, filed 20 April 2009, that the Hopenfeld reference discloses washing away oil or water soluble epoxy and should not be combined has been fully

considered but is not persuasive. Examiner disagrees. It appears Applicant failed to recognize the purpose of the inclusion of the Hopenfeld reference. The Hopenfeld reference was not incorporated for the purpose of washing away oil or water soluble epoxy but rather how fiber optics may be potted with epoxy relative to a tank surface. Thus, Applicant's arguments are not relevant to the provided combination. Therefore, the rejections, as set forth above, are maintained.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Francis M. LeGasse Jr whose telephone number is (571) 272-9798. The examiner can normally be reached on Monday through Thursday 7:00 am to 5:30 pm E.S.T.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Georgia Y. Epps can be reached on (571) 272-2328. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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